Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Reducing, we have,

$$x^3+3x^2-3=0 \ldots\ldots (2).$$

By Horner's method, we have from equation (2), $x=0.879385+$. Therefore

$$\frac{1}{x+3}=\frac{1}{3.839385}; \quad \frac{1}{x+2}=\frac{1}{2.879385}; \text{ and } \frac{1}{x+1}=\frac{1}{1.879385}.$$

It is evident that C is the best clerk and was given the 93% on the efficiency record. The records should be inversely proportional to the time expended for equivalent work. In order to compare C and B, and C and A, we have

$$x+2 : x+1=93\% : B\text{'s mark};$$
$$x+3 : x+1=93\% : A\text{'s mark};$$

and therefore,

$$2.879385 : 1.879385=93\% : 60.70\%=B\text{'s mark; and}$$
$$3.879385 : 1.879385=93\% : 45.05\%=A\text{'s mark.}$$

Thus, if C were given on the efficiency record 93%, A should be given 45.05%, and B should be given 60.70%.

Also solved by G. B. M. Zerr, S. A. Corey, G. W. Greenwood, F. D. Whitlock, R. D. Carmichael, A. H. Holmes, and J. Scheffer.

224. Proposed by G. W. GREENWOOD, M. A. (Oxon), Lebanon, Ill.

Show that, if none of the quantities x, y, z is zero, the result of eliminating them from

$$(x+y)(x+z)=bcyz \ldots\ldots (1),$$
$$(y+z)(y+x)=cazx \ldots\ldots (2),$$
$$(z+x)(z+y)=abxy \ldots\ldots (3),$$

is $\begin{vmatrix} \pm a, & 1, & 1 \\ 1, & \pm b, & 1 \\ 1, & 1, & \pm c \end{vmatrix}=0.$

[Oxford, 1896.]

Solution by C. H. MILLER, West Point, N. Y., and the PROPOSER.

By multiplying the second equation by the third, dividing by the first, and transposing, we obtain

$$\pm ax+g+z=0.$$

From this, and two similar equations, we get the required elimininant.

Also solved by J. B. Faught, G. B. M. Zerr, R. D. Carmichael, J. Scheffer, and J. O. Mahoney.

225. Proposed by H. M. ARMSTRONG, Cooch's Bridge, Delaware.

If $\alpha=ax+cy+bz \ldots\ldots (1)$, $\beta=cx+by+az \ldots\ldots (2)$, $\gamma=bx+ay+cz \ldots\ldots (3)$, show that $\alpha^3+\beta^3+\gamma^3-3\alpha\beta\gamma=(a^3+b^2+c^3-3abc)(x^3+y^3+z^3-3xyz)$.

Solution by the PROPOSER.

The required result follows directly from the equality,

$$\begin{vmatrix} \alpha & \beta & \gamma \\ \gamma & \alpha & \beta \\ \beta & \gamma & \alpha \end{vmatrix} = \begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix} \cdot \begin{vmatrix} x & y & z \\ z & x & y \\ y & z & x \end{vmatrix}.$$

Also solved by J. B. Faught, G. B. M. Zerr, G. W. Greenwood, Grace M. Bareis, J. O. Mahoney, F. D. Posey, F. O. Whitlock, J. Scheffer.

*** Dr. L. E. Dickson points out that a similar theorem holds for any determinant whose matrix is the body of a multiplication-table of a finite group.

GEOMETRY.

251. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

Represent the vertices of any regular polygon by the consecutive numbers 1, 2.....p.....q.....r.....n. To find the sides and area of the triangle formed by joining p, q, and r.

Solution by G. W. GREENWOOD, M. A. (Oxon), Lebanon, Ill., and A. H. HOLMES, Brunswick, Me.

The central angles subtended by the chords (pq) and (qr) are respectively,

$$2(q-p)\frac{\pi}{n} \text{ and } 2(r-q)\frac{\pi}{n}.$$

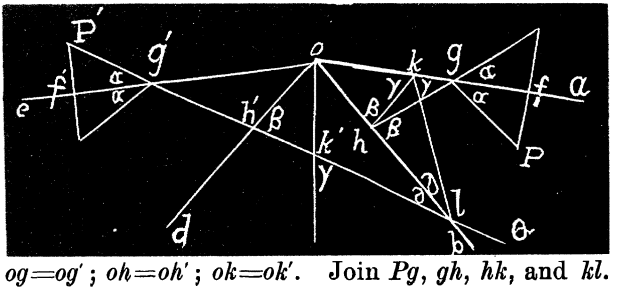
The angle pqr is found to be $\pi-(r-p)\frac{\pi}{n}$. Hence the required area is

$$\tfrac{1}{2}.pq.qr.\sin \angle pqr = 2a^2 \sin(q-p)\frac{\pi}{n}.\sin(r-q)\frac{\pi}{n}.\sin(r-p)\frac{\pi}{n},$$

where a is the radius of the circum-circle of the polygon.

252. Proposed by FREDERICK R. HONEY, Ph. B., Trinity College, Hartford, Conn.

Two plane mirrors form an angle which is less than 45°. Any two points are assumed within this angle in a plane perpendicular to the intersection of the mirrors. A ray of light passes through one point, and after being reflected twice at each mirror, it passes through the second point. Find the path of the ray.

Solution by R. A. WELLS, Westminster College, Fulton, Mo.; THEODORE LINQUIST, Wahpeton, N. D.; and the PROPOSER.

Let oa and ob represent the mirrors; and P and Q the assumed points. Draw oc, od, and oe, making each of the angles boc, cod, and doe equal to aob. Draw Pf perpendicular to oa. Make $of=of$; and draw fP' perpendicular to oe and equal to Pf. Draw QP', intersecting ob at l, oc at k', od at h', and oe at g'. Make $og=og'$; $oh=oh'$; $ok=ok'$. Join Pg, gh, hk, and kl. $PghklQ$ is the path of the ray.